## Deterministic Finite Automata - Lecture 2 <br> James Marshall

A DFA to recognise binary numbers divisible by 2 (from last lecture):


Design a DFA to recognise binary numbers divisible by 3 :
How would we work out if a number is divisible by 3?

## $1 1 \longdiv { 1 0 0 1 0 }$




## Regular Operations

## Definition

If $A$ and $B$ are languages then the regular operations union, concatenation, star and complement are defined as

- Union:
- Concatenation:
- Star:
- Complement:


## Examples

## Theorem

The class of regular languages is closed under the regular operations

## Theorem

The class of regular languages is closed under the union operation
Proof Sketch (by construction)
$M_{1}=\left(Q_{1}, \sum, \delta_{1}, q_{1}, F_{1}\right)$ recognises $\mathrm{A}_{1}$
$M_{2}=\left(Q_{2}, \sum, \delta_{2}, q_{2}, F_{2}\right)$ recognises $\mathrm{A}_{2}$
Design $M=\left(Q, \Sigma, \delta, q_{0}, F\right)$ that recognises $A_{1} \cup A_{2}$

